

Learning Target: I can find exact sine and cosine values using the unit circle, reference angles, and the Pythagorean identity.

Vocabulary

Term	Meaning
Unit Circle	A circle of radius 1 centered at the origin; the point at angle θ is $(\cos\theta, \sin\theta)$.
Periodic Function	A function that repeats its values at regular intervals; sine and cosine have period 2π .
Pythagorean Identity	$\sin^2\theta + \cos^2\theta = 1$, true for every angle θ .

Key Concept: The Unit Circle & Special Angles

POINT ON THE UNIT CIRCLE At angle θ , the point is $(\cos\theta, \sin\theta)$. Memorize the special angle values in Quadrant I: $0, \pi/6, \pi/4, \pi/3, \pi/2$.

EXAMPLE 1

Find $\sin(\pi/3)$ and $\cos(\pi/3)$.

$\sin(\pi/3) = \rule{1cm}{0.4pt}$ $\cos(\pi/3) = \rule{1cm}{0.4pt}$

Key Concept: Using Reference Angles in Other Quadrants

ASTC: ALL, SINE, TANGENT, COSINE (positive in each quadrant, going counterclockwise from Q1)
Find the reference angle, look up its value, then apply the correct sign for the quadrant.

EXAMPLE 2

Find $\sin(5\pi/6)$. Reference angle: $\pi/6$ (Quadrant II, sine positive).

$\sin(5\pi/6) = \sin(\pi/6) = \rule{1cm}{0.4pt}$

EXAMPLE 3

Find $\cos(4\pi/3)$. Reference angle: $\pi/3$ (Quadrant III, cosine negative).

$$\cos(4\pi/3) = -\cos(\pi/3) = \underline{\hspace{2cm}}$$

COMMON MISTAKE

Finding the reference angle only gives you the MAGNITUDE — you must still determine the correct sign based on the quadrant!

Key Concept: The Pythagorean Identity**EXAMPLE 4**

Given $\sin\theta=3/5$ and θ in Quadrant II, find $\cos\theta$.

$$\cos^2\theta = 1 - 9/25 = \underline{\hspace{2cm}} \rightarrow \cos\theta = \pm \underline{\hspace{2cm}} \rightarrow \text{since Q2 is negative for cosine: } \cos\theta = \underline{\hspace{2cm}}$$

Guided Practice — Part A: Special Angles

A1 Find $\sin(\pi/4)$ and $\cos(\pi/4)$.

A2 Find $\sin(\pi/6)$ and $\cos(\pi/2)$.

Guided Practice — Part B: Reference Angles in Other Quadrants

B1 Find $\sin(7\pi/6)$.

B2 Find $\cos(5\pi/3)$.

Guided Practice — Part C: Signs by Quadrant

- C1** Determine the sign of $\sin$ and $\cos$ for an angle in Quadrant III.

- C2** Determine the sign of $\sin$ and $\cos$ for an angle in Quadrant IV.

Guided Practice — Part D: Pythagorean Identity

- D1** Given $\cos\theta=5/13$, θ in Quadrant I, find $\sin\theta$.

- D2** Given $\sin\theta=-7/25$, θ in Quadrant III, find $\cos\theta$.

BEFORE YOU MOVE ON

Check with a partner: after using the Pythagorean identity, did you assign the correct sign based on the given quadrant?